

Water Technologies & Solutions

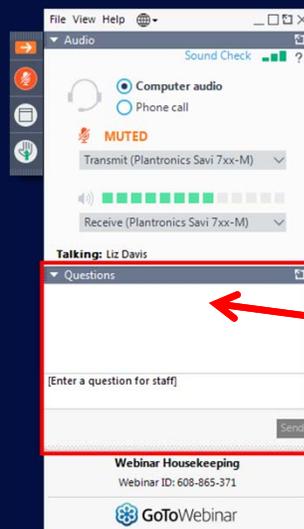
The Tale of Two Systems: 2PAD & 6-Pack Effectively Using biological Hydrolysis to Enable Co-digestion

June 23, 2020
WEF eShowcase



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How to Participate Today



- **Audio Modes**
 - Listen using Mic & Speakers
 - Or, select "Use Telephone" and dial the conference (please remember long distance phone charges apply).
- **Submit your questions using the Questions pane.**
- **A recording will be available for replay shortly after this webcast.**



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today's speakers & agenda



Nick Bonkoski
SUEZ

Moderator



Michael Theodoulou
SUEZ

Technology overview –

- Anaerobic Digestion enhancement through biological hydrolysis
- SUEZ core technology: 6-Pack & 2Pad
- Enabling maximum digester utilization for renewable energy



Wesley Wong
GENeco

Focus Facility –

Avonmouth, Bristol, UK.
Co-located Digestion for Food Waste & Sewage Sludge



Tom Darby
Hermitage

Focus Facility –

Hermitage, PA, USA.
Co-digestion of Food Waste & Sewage Sludge



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Biosolids Anaerobic Digestion

Mesophilic CSTR

CSTR = all phases, same tank

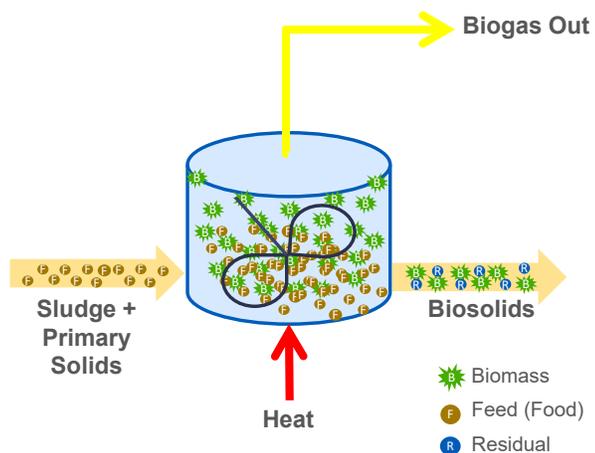
○ Hydrolysis



○ Acidogenesis



○ Methanogenesis



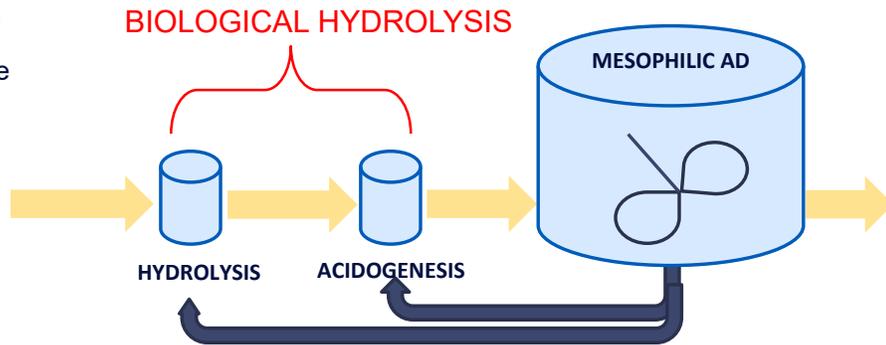
hydrolysis is the rate limiting step

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Optimize for AD Phase Kinetics

Increase Digester Efficiency

- Reactor Design
- Residence Time
- Temperature

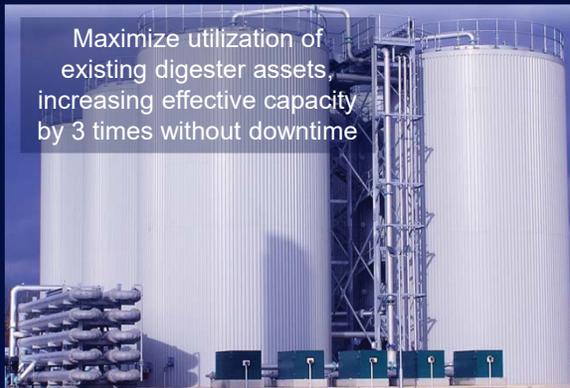


provide optimum environment to maximize kinetics

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SUEZ Biological Hydrolysis

The "6-Pack"



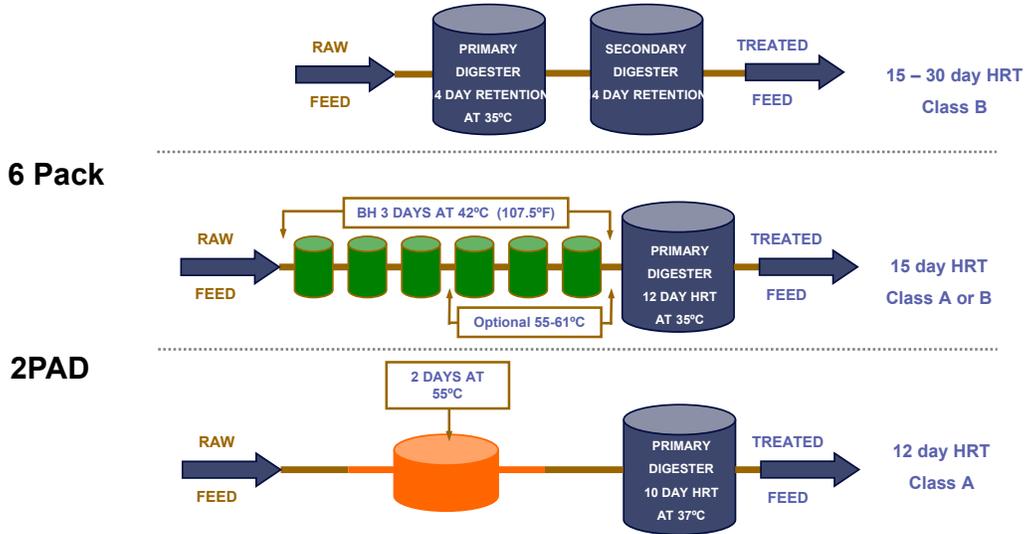
2PAD



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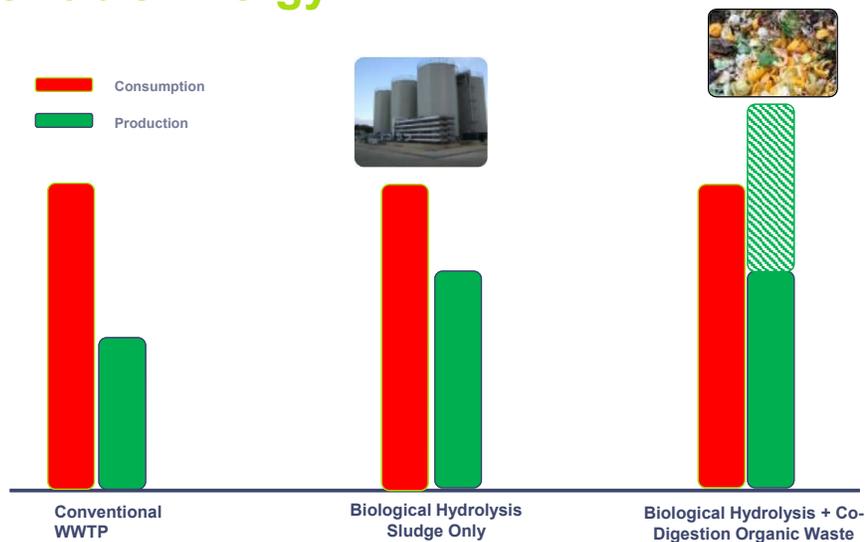
Biological Hydrolysis Flow Configurations

Conventional Mesophilic



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Enabling Maximum Digester Utilization for Renewable Energy



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GENECO
Sustainable Solutions

Avonmouth facility – from sewage treatment to renewable energy generation

Wesley Wong
June 2020



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GENECO
Sustainable Solutions

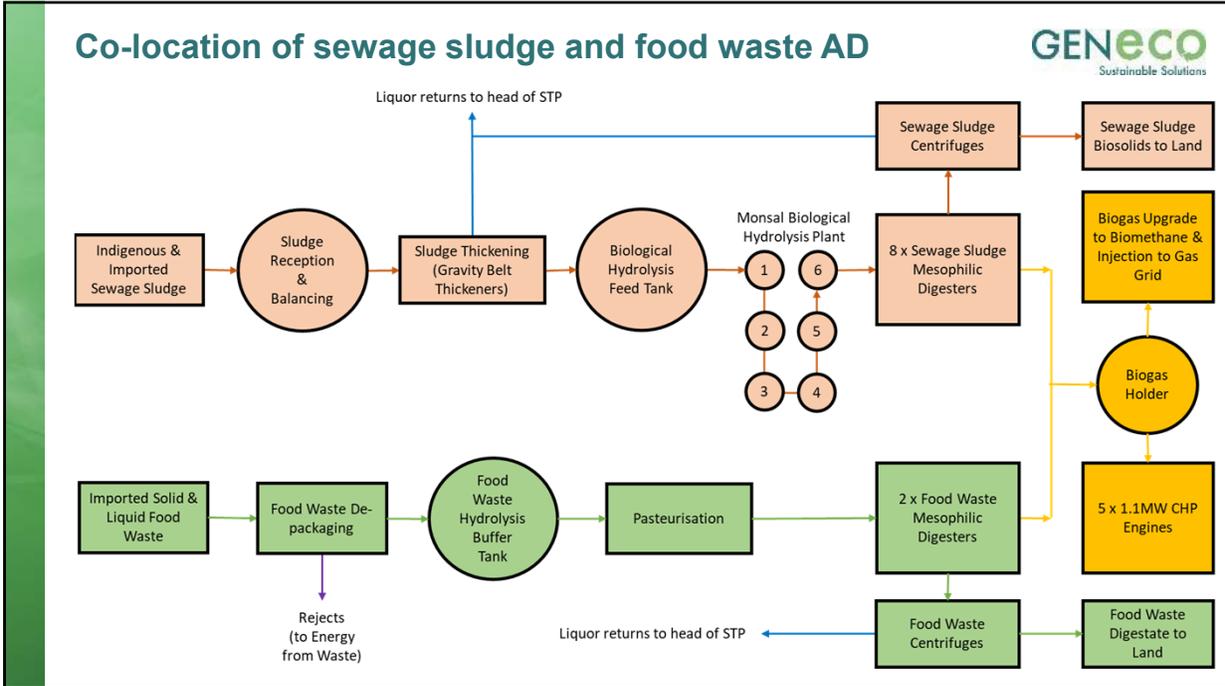
Site overview – what we do

Avonmouth, Bristol, United Kingdom

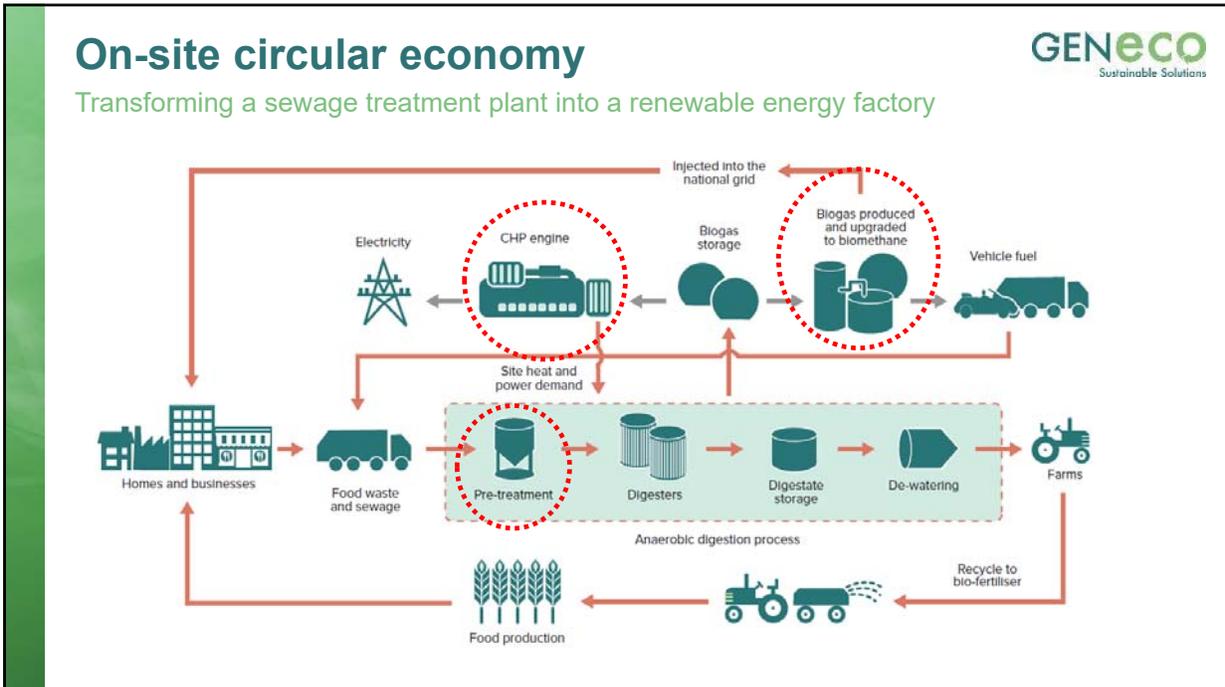
- 800,000 PE (300 ML/d) sewage treatment plant
- 657,000 m³/a (36,500 tds/a) sludge AD facility
- 50,000 t/a food waste AD facility
- 30GWh/a CHP power generation
- 80GWh/a biomethane injection to grid




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Biological hydrolysis

Sewage sludge AD pretreatment



- Improves digestion efficiency by separating the AD process into two stages
- Biological hydrolysis breaks down organic material in sludge into short-chained acids which becomes the feed for mesophilic digesters for methane production
- The required hydraulic retention time in the digesters was reduced from 18 days to 12 days, thereby freeing up digestion capacity to enable food waste AD at Avonmouth

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AD performance overview



	Sewage sludge	Food waste
Daily feed (m ³ /d)	1,800	200
Daily biogas production (m ³ /d)	42,000	20,000
Organic loading rate (kg VS/m ³ .d)	4.0	4.2
Volatile solids destruction (%)	50	75
Hydraulic retention time (days)	12	20
Biogas yield (m ³ CH ₄ /kg VS dest.)	0.9	2.0
pH	5.5 (Bio. Hydrolysis) 7.5 (Mesophilic Digs.)	7.5
Temperature (°C)	36 (both)	39

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Renewable energy at Avonmouth



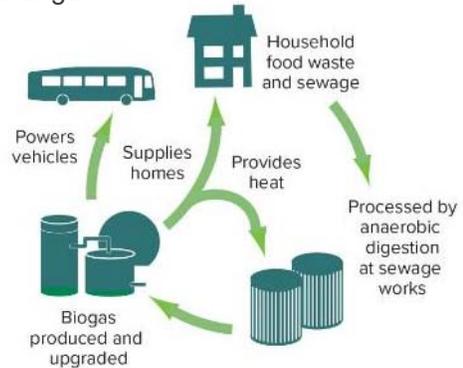
Biomethane, renewable electricity & heat



Biogas is purified to 98% methane through water-washing, upgraded with propane, and injected into the gas grid as direct substitute for natural gas



A portion of the site's biogas production is used in CHP engines to produce renewable electricity and heat for running the site



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Biomethane in transport



Innovation initiatives at Avonmouth



Bio-Bus initiative in 2015 – first UK bus to run on biomethane fuel



Bio-Bee – food waste collection vehicle powered by biomethane; closing the loop on a circular economy at Avonmouth



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HERMITAGE FOOD WASTE TO ENERGY

JUNE 2020



This slide features a collage of images related to the food waste to energy process. It includes an exterior view of a facility with large white domes, a close-up of yellow industrial machinery, a white robotic arm in a warehouse, a table of fresh produce, a person in a hard hat, and a large white dome structure. The text 'HERMITAGE FOOD WASTE TO ENERGY' is centered in white on a dark teal background, with 'JUNE 2020' to the right. The official seal of Hermitage, Pennsylvania, is in the bottom right corner.

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Achieving Net Zero

Our goal and then some



Manager Tom Darby and PA Secretary Patrick McDonnell



This slide has a dark teal background with white text. The main title 'Achieving Net Zero' is in a large font, with the subtitle 'Our goal and then some' below it. A large photo shows two men, Tom Darby and Patrick McDonnell, looking at a computer monitor. A smaller inset photo shows a warehouse interior with stacked boxes. The names of the men are printed below the main photo.

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Facility Description

- ▶ The Hermitage Municipal Authority owns and the City of Hermitage operates the Sewage Treatment Facility located in the City of Hermitage, Mercer County, Pennsylvania
- ▶ Serves the communities of:
 - ▶ The City of Hermitage
 - ▶ Clark Borough
 - ▶ Jefferson Township
 - ▶ Shenango Township
 - ▶ South Pymatuning Township
 - ▶ Wheatland Borough



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Facility Layout



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Operations

- ▶ Wastewater Treatment:
 - ▶ Screening – coarse, fine, and grit removal
 - ▶ Sequencing Batch Reactors
 - ▶ UV Disinfection – Trojan System



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Food Waste Stream

Pre-consumer Products

▶ Anaerobic Digestion:

- ▶ Dairy Products
- ▶ Pet Food
- ▶ Restaurant and Institutional
- ▶ Grocery and Green Crop
- ▶ Beverages Bottled and Bulk
- ▶ Fats Oil and Grease



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Biosolids Handling

- ▶ Thickening
- ▶ Anaerobic Digestion
- ▶ Gravity Belt Thickener and
- ▶ Belt Filter Press
- ▶ Roll Offs for Pick Up



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Methane Production

- ▶ Biogas:
 - ▶ Gas Clean Up System
 - ▶ Energy Conversion and Generation to Electric Grid
 - ▶ Caterpillar BioGas Engine
 - ▶ Nissen BioGas Engine



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Bio Methane Gas



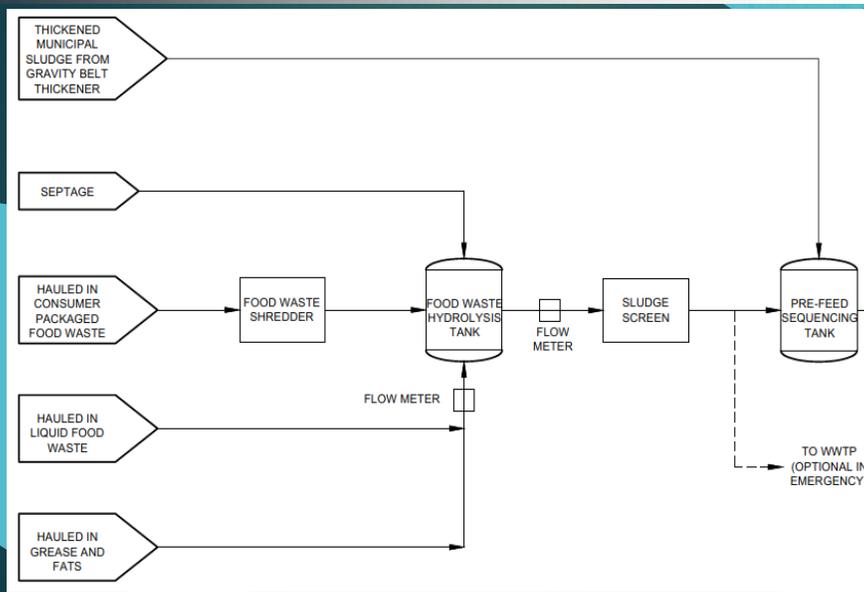
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SUEZ Two Pad AD Process

- ▶ Currently Feeding in Automatic Mode
- ▶ 30,000 Gallons Per Day Total
- ▶ Aprox. 30 % is Food Waste or 10,000 Gals
- ▶ Can feed up to 57,000 GPD

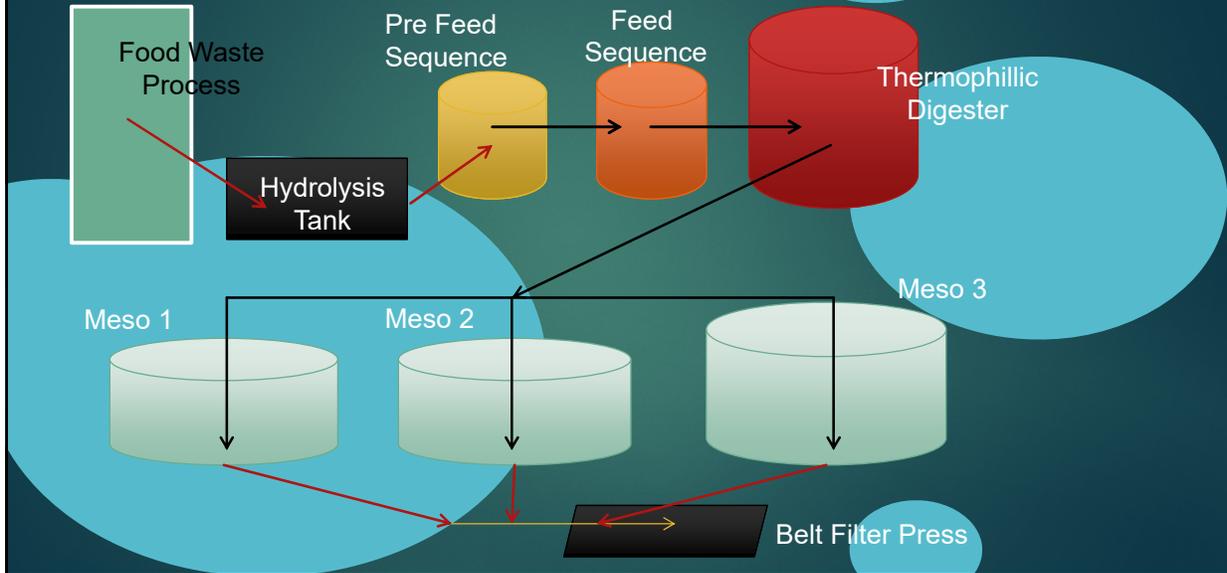
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Current Operations at Hermitage



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Current Operations at Hermitage



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What's next?

1. Larger Hydrolysis Tank
2. Organic Waste Storage Tanks
3. Characterize Food Waste Strengths For Blending Purposes
4. Convince Legislators to Buy In!

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Q&A



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